

WHAT IS CLAIMED IS:

- 1 1. A light collection system comprising:
2 means for collecting light, said means having a plurality of surfaces; and
3 a plurality of light sources positioned to direct light toward said means for
4 collecting light;
5 wherein said surfaces direct light from said light sources in a direction
6 towards a target area.
- 1 2. The system of claim 1 wherein a light source directs light through
2 the means for collecting light, said light exiting through a top surface of the means for
3 collecting light having a truncated pyramid shape.
- 1 3. The system of claim 1 further comprising a housing for positioning
2 said light sources to direct light toward the means for collecting light.
- 1 4. The system of claim 1 wherein said light sources comprise a panel
2 of LEDs.
- 1 5. The system of claim 1 wherein said light sources comprise a panel
2 of LEDs projecting white light.
- 1 6. The system of claim 1 wherein said light sources comprise a panel
2 of LEDs and a plurality of parabolic concentrators positioned to direct light from the
3 LEDs towards the light collector.
- 1 7. The system of claim 1 wherein the light sources are selected from:
2 an LED capable of between about 1-5 watts at 1 amp.
- 1 8. The system of claim 1 wherein the light sources are selected from:
2 an LED capable of at least 80 lumens at 1 amp and 3 watts.
- 1 9. The system of claim 1 wherein the light sources are selected from:
2 an LED capable of at least 120 lumens at 1 amp and 5 watts.
- 1 10. The system of claim 1 wherein surfaces of the light collector have a
2 thin film selected from the following materials to optimize performance: silicon oxide.

1 11. The system of claim 1 wherein said light collector includes optical
2 coatings to create a consistent set of indices of refraction.

1 12. The system of claim 1 wherein substantially all optical elements
2 include optical coatings to create a consistent set of indices of refraction.

1 13. The system of claim 1 further comprising an image panel, wherein
2 said light collector is used to direct the light toward the image panel.

1 14. The system of claim 1 wherein said light collector is hollow.

1 15. The system of claim 1 wherein said light collector is made of a
2 material selected from: aluminum, glass, a reflective polymer, or reflective metal.

1 16. The system of claim 1 further comprising an LCD panel having a
2 greater than 9" diagonal, with a resolution at least equal to that of HDTV, wherein said
3 light collector is used to direct the light toward the LCD panel.

1 17. The system of claim 1 wherein:
2 a first of said surfaces reflects light from a first of said light sources;
3 a second of said surfaces reflects light from a second of said light sources;
4 a third of said surfaces reflects light from a third of said light sources;
5 a fourth of said surfaces reflects light from a fourth of said light sources;

1 18. An image projection system comprising:
2 a light collection device; and
3 a plurality of light sources positioned to direct light toward said collection
4 device;

5 a first fresnel lens positioned to concentrate and focus the output light
6 toward the light collection device;

7 a second fresnel lens;

8 an image panel, wherein the second fresnel lens is positioned to disperse
9 the light in such a manner as to provide substantially uniform light on the image panel.

1 19. The system of claim 18 wherein the image panel comprises an
2 LCD panel.

1 20. The system of claim 18 wherein the image panel comprises an
2 LCD panel having a diameter greater than 9 inches.

1 21. The system of claim 18 further comprising an optical train for
2 projecting image from the image panel onto a target area.

1 22. The system of claim 18 further comprising a parabolic rectangular
2 concentrator focusing light from the light sources to the first fresnel lens, said
3 concentrator has unique formulas to produce high light output of about 95% at small
4 angles of no more than about 3 degrees.

1 23. The system of claim 18 further comprising a polarizing recombiner
2 is used to increase the brightness of the image, said recombiner receiving light from the
3 second fresnel lens;

4 wherein said polarization recombiner is configured to allow light having a
5 first polarization to pass;

6 wherein said polarization recombiner is configured to convert light of a
7 second polarization to light having the first polarization and letting converted light pass to
8 the image panel.

1 24. The system of claim 18 further comprising a polarizing recombiner
2 is used to increase the brightness of the image, said recombiner receiving light from the
3 light collector;

4 wherein said polarization recombiner is configured to allow light having a
5 first polarization to pass;

6 wherein said polarization recombiner is configured to convert light of a
7 second polarization to light having the first polarization and letting converted light pass to
8 the image panel.

1 25. A color image projection system comprising a plurality of systems
2 as described in claim 18, one for each color, then recombining output of each of said
3 systems 18 using dichroic mirrors.

1 26. The system of claim 18 further comprising a projection lens is
2 liquid filled for low manufacturing cost and very high performance.

1 27. The system of claim 18 further comprising a projector housing
2 containing the light collection device, the plurality of light sources, the lenses, and an
3 image panel.

1 28. A light collection system comprising:
2 means for collecting light; and
3 a plurality of light sources positioned to direct light toward said collection
4 device;
5 wherein said means for collecting light directs light from the light sources
6 in a direction towards a target area.

1 29. A projection system comprising:
2 a light source;
3 a polarization device positioned to receive light from said light source; and
4 an LCD image panel receiving light from the polarization device;
5 wherein said polarization device is configured to allow light having a first
6 polarization to pass;
7 wherein said polarization device is configured to convert light of a second
8 polarization to light having the first polarization and letting converted light pass to the
9 LCD image panel.

1 30. The system of claim 29 wherein the polarization device comprises
2 a $\frac{1}{2}$ wave plate for converting light of a second polarization to light having the first
3 polarization.

1 31. A projection system comprising:
2 a first module having:
3 a light collection device; and
4 a plurality of light sources positioned to direct light toward said
5 collection device, said light sources projecting light of a single color;
6 a first fresnel lens positioned to concentrate and focus the output
7 light toward the light collection device;
8 a second module having the same elements of the first module, wherein
9 said light sources project a second color;

10 a third module having the same elements of the first module, wherein said
11 light sources project a third color;
12 a first dichroic directing light from the first module with light from the
13 second module;
14 a second dichroic directing light from the third array with light from the
15 second module;
16 a polarization device positioned to receive light from said first dichroic
17 and second dichroic; and
18 an LCD image panel receiving light from the polarization device;
19 wherein said polarization device is configured to allow light having a first
20 polarization to pass;
21 wherein said polarization device is configured to convert light of a second
22 polarization to light having the first polarization and letting converted light pass to the
23 LCD image panel.

1 32. An image projection system comprising:
2 a light collection device; and
3 a plurality of light sources positioned to direct light toward said collection
4 device;
5 an image panel, wherein a fresnel lens is positioned to disperse the light in
6 such a manner as to provide light on the image panel;
7 wherein any portion of the image panel absorbs no more than about 4
8 watts per square inch from light directed at the panel.

1 33. The system of claim 32 wherein any portion of the image panel
2 absorbs no more than about 3 watts per square inch from light directed at the panel.

1 34. The system of claim 32 wherein wherein any portion of the image
2 panel absorbs no more than about 2 watts per square inch from light directed at the panel.

1 35. The system of claim 32 wherein any portion of the image panel
2 absorbs no more than about 1 watts per square inch from light directed at the panel.

1 36. The system of claim 32 wherein any portion of the image panel
2 absorbs no more than about 0.29 watts per square inch from light directed at the panel.

1 37. A method for projecting an image, the method comprising:
2 providing a plurality of light sources;
3 collimating light using a parabolic concentrator;
4 directing light from a plurality of light sources towards a light collector
5 which directs light towards a fresnel lens which directs light to a polarizing recombiner;
6 using the recombiner to allow light having a first polarization to pass;
7 using the recombiner to convert light of a second polarization to light
8 having the first polarization and letting converted light pass to an LCD image panel.

1 38. A method of manufacturing an image projector, the method
2 comprising:
3 providing a plurality of light sources;
4 coupling said light sources to a parabolic concentrator;
5 positioning a light collector to receive light from a plurality of light
6 sources, wherein the light collector is also positioned to direct light towards a fresnel lens
7 which directs light to a polarizing recombiner;
8 providing a polarization recombiner wherein using the recombiner allows
9 light having a first polarization to pass; and
10 wherein using the recombiner converts light of a second polarization to
11 light having the first polarization and letting converted light pass to an LCD image panel.

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